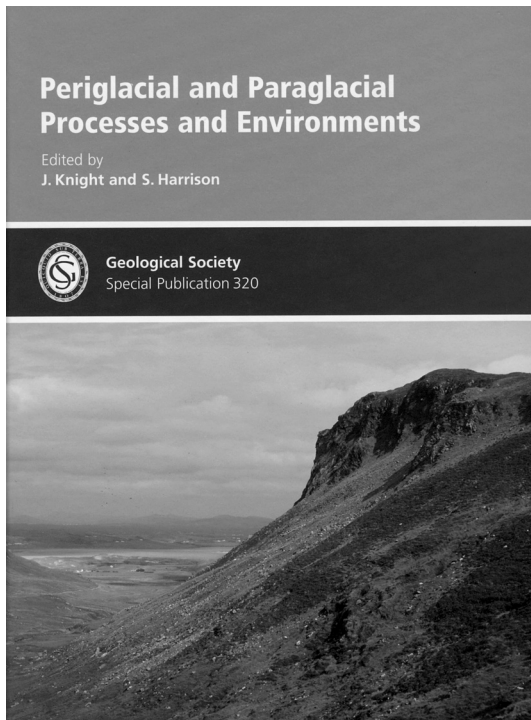


**Periglacial and paraglacial processes and environments**, edited by J. Knight & S. Harrison, 2009. Geological Society Special Publication 320. The Geological Society of London, Publishing House, Unit 7, Brassmill Enterprise Centre, Brassmill Lane, Bath, BA1 3JN, United Kingdom. Hardback, 272 pages. Price GBP 90.00 (fellows GBP 45.00; corporate affiliates GBP 72; other societies GBP 54). ISBN 978-1-86239-281-6.



This volume deals with surface processes in cold, non-glaciated environments and contains fifteen contributions written by authors from British, French, Canadian, and Finnish research institutions. The book is, as many more in this prestigious series, the outcome of a conference (2007), organized jointly by the Geological Society and the Quaternary Research Association. The contributions focus on two notions, widely used in the scientific literature since a long time, sounding almost identical and yet having very different meanings. Despite years of extensive use, they remain controversial, too.

'Periglacial' is a term present in geomorphology since almost 100 years, as it was introduced into the scientific vocabulary by a Polish geologist, Walery Łoziński, in 1909. Initially, it had evident geographical connotations, having been employed to characterize cold areas around Pleistocene glaciers and ice sheets. By implication, surface processes in this zone were controlled by cold-climate environmental conditions,

and the role of frost shattering to produce extensive block fields was emphasized in particular. The meaning of the term evolved during the next decades, with increasing focus on processes conditioned by low air and ground temperatures. It soon became clear that frost and ground ice are effective agents of landscape change not only adjacent to glaciers and ice sheets, but at high latitudes and altitudes in general. The term 'periglacial zone' was consequently no longer confined to ice-sheets margins, but became defined in the sense of low mean annual or seasonal temperatures. Recently, however, a tendency develops towards replacement of this meaning by the more general meaning of 'presence of cold-climate processes', whereas occasionally calls are heard suggesting to return to the original, more meaningful, definition put forward by Łoziński. The history of periglacial research, with its days of glory and phases of doubts, is expertly summarized in the opening chapter of the volume, by Marie-Françoise André.

The history of the 'paraglacial' concept is much younger. The term was coined in 1971 by June Ryder and a year later formally defined as 'non-glacial processes that are directly conditioned by glaciation'. However, the focus of initial studies on 'paraglacial' was largely restricted to glacial sediment supply and its subsequent reworking, mainly by fluvial systems. As with 'periglacial', the meaning of 'paraglacial' evolved beyond its original definition, embracing numerous cold-climate processes, involving different temporal and spatial scales, hence overlapping with 'periglacial', and eventually causing confusion. The contribution by Olav Slaymaker is a most useful critical discussion of the term and points out the way for further research in this field.

Taking the volume as a whole, the issues of 'paraglacial', somewhat contradictory to the title, dominate. This is reflected in the subdivision of the book. Only part 1 deals with perigla-

cial environments (although the above-mentioned paper by Slaymaker has been included here). Part 2 contains five chapters under the common theme 'Paraglacial environments and processes in the British Isles', whereas Part 3 brings our attention to 'Paraglacial processes, climate change and sediment supply', represented by another five contributions. However, the title of Part 3 could as well have been 'Paraglacial environments outside the British Isles', as problems of climate change and sediment supply are present throughout both sections.

A more general reflection is in place here. Is it really useful to speak about – and emphasize – 'paraglacial processes'? The landscape changes described by the authors are the result of well-known geomorphic processes as weathering, mass movement, fluvial transport, ground-ice melting, etc. I agree with Olav Slaymaker that the most fruitful way of using the term 'paraglacial' is in the context of landscape disturbance after glaciations and its response to non-glacial conditions. These non-equilibrium landscapes have their own specific spatial and temporal dimensions, and they are characterized by specific rates of surface processes, but none of the mechanisms behind these processes are typical of paraglacial environments.

Back to individual chapters: the majority of them concern slope processes and their impact on fluvial systems. The volume will therefore be primarily of interest to researchers of hillslopes and slope sediments. Whalley discusses various forms of mixed ice and debris accumulation, with particular emphasis on rock glaciers and protalus ramparts. Jarman provides an extensive study of rock-slope failures within glacial troughs in the Scottish Highlands, regarded as a response to ice withdrawal and slope de-buttressing. He argues that rockslides are powerful agents of trough widening and destruction of the inherited preglacial watershed relief. Massive rock-slope failures are also the main subject of Hewitt, who worked in the Karakoram, and who considers this high-mountain landscape as a good example of 'disturbance-regime' geomorphology. Wilson analyzes rockfall talus slopes in Great Britain and Ireland, and discusses the extent to which they are periglacial or paraglacial, whereas Curry et al. describe surface

changes on a steep lateral moraine in one of the Alpine valleys in Switzerland. The latter study involves geotechnical laboratory tests.

Three other chapters focus on fluvial responses to changes in sediment supply as a result of glacier fluctuations or mass movements. Wilkie & Clague show how the Nostetuko river in British Columbia reacted to climate-driven glacier advances and retreats during the Holocene, whereas Friele & Clague present an interesting case study of varying sediment supply from young volcanoes, again in British Columbia. Finally, Passmore & Waddington analyze a comparatively rare example of a fluvial system emerging from drainage of a Late Pleistocene ice-dammed lake.

The remaining contributions are more difficult to group under one heading. They concern rock surface weathering (Nicholson), palsa formation (Seppälä & Kujala), and problems of Quaternary lithostratigraphy in southern Ireland (Knight). A good base for further discussion is offered by Waller et al., who notice that collaboration between researchers investigating basal glacier ice and ground ice is insufficient; they examine potential benefits if such a collaboration would take into effect.

This most interesting and useful volume ends with a summary chapter by one of the editors (Harrison), who puts the paraglacial environments into the wider context of climate change and climate sensitivity. He suggests that, with an ongoing climate change towards warming, we shall see more paraglaciation, and that for some time this predicted period of sediment reworking will be the last episode of major sediment movement on the time scale of the next tens of thousands of years.

To conclude, the Geological Society produced a most valuable addition to the series, of primary interest to geomorphologists, but certainly to Quaternary geologists and sedimentologists as well. It contains a number of well documented case studies and a few thought-provoking overviews and discussions. Highly recommended to any earth scientist interested in cold environments.

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